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Electronic Waste Management: Toxicity and Emerging Challenges in Indian Context

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Abstract: E-waste is posing a serious threat to the life of human being. The rate of emission of toxic pollutants from e-wastes is increasing at alarming rate. Despite the danger signals raised by various research bodies throughout the world, the governments across the globe have failed to handle this emerging issue efficiently. Where, import of used electronic products from developed nations can be cited as one of the major reasons for e-waste generation in India, handling and recycling of e-waste by unorganized recyclers in another issue. This paper attempts to throws a light on the data depicting the increase in rate of e-waste generation; it also discusses various reasons for this increase. At the end, some suggestions to overcome this issue have been given.

Keywords: E-waste, Recycling, Management, Diseases, Toxins

1. Introduction

Advancement in science and technology front has brought revolution in everyday life. There is no doubt that these developments have changed the era of human civilization. However, this revolution has posed serious threat to life and environment due to hazardous substances used in these technology dominated gadgets. Last decade witnessed tremendous increase in the rate of purchase of electronic products due to which the rate of these gadgets becoming obsolescent has also increased. Due to tremendous increase in this rate, management of electronic and e-waste has also become a challenge in the present times.

Lalchandani [1] observed emergence of serious threat from electronic products such as computer, printers, monitors, keyboard, cellular phones, CD's, new generation televisions, air conditioners, computer accessories and other household gadgets and machines. These gadgets are composed of ferrous and non-ferrous metals, plastics, glass, wood and plywood, printed circuit boards, concrete, ceramics, rubber and other items [2]. Major components of such products are iron and steel (50%), plastics (21%), non-ferrous metals (13%) and other ingredients (16%). Non-ferrous metals typically consist of certain metals such as aluminum, copper and other valuable metals such as silver, gold and platinum etc [3].

However, the presence of lead, arsenic, mercury and other flame retardant elements pose serious threat to life, health and environment. Studies have claimed that by burning these products, toxic and harmful gasses containing numerous substances are emitted and among all the products computers pose maximum threat in terms of health, environment and life respectively [4].

2. Global Scenario

The Institute of Advanced Study of Sustainability (UNU-IAS) claimed generation of 41.8 million tonnes of e-waste in 2014 which is projected to increase to 49.8 million tonnes by the end of year 2018. Out of 41.8 Mt of e-waste, small equipments contributed to the extent of 12.8 Mt followed by large equipments (11.8 Mt), temporary exchange equipments (7 Mt), screens (6.3 Mt), small IT products (3 Mt) and lamps (1 Mt) [5]. Although, the total e-waste generated during the last six years were observed to be less than the earlier

projection still the rate of growth of e-waste generation is quite alarming. As regards global scenario, significant increase in generation of e-waste per person in expected. ISRI report 2009 claimed that per person generation of e-waste increased from 5 Kg in 2010 to 5.9 Kg in 2014 which is likely to increase to 6.7 Kg by the year 2018 [6].

On region wise analysis of e-waste generation Asia was found to be leading with generation of 16 million tones waste in year 2014 followed by America (11.7 Mt), Europe (11.6 Mt) and Africa (1.9 Mt). Oceanic region generated least quantity of e-waste with 0.6 million tonne. However, as far per person generation of e-waste is concerned, Europe was found to be the leading continent with 15.6 Kg per person followed by Oceanic (15.2 Kg), America (12.2 Kg), Asia (3.7 Kg) and Africa (1.7 Kg).

3. Indian Scenario

There is no authentic data related to e-waste generation in India. Moreover, the data available on this issue do not match with each other. Whereas, CAG report claimed generation of 7.2 Mt by industrial waste, 4 lakh tonnes of electronic waste, 1.5 Mt of plastic waste, 1.7 Mt of medical waste and 48 Mt of municipal waste annually in India [7], yet as per the claims of UNU-IAS, India generated 1.7 million tonne of e-waste. In another report published by the Central Pollution Control Board (CPCB) in 2005, India was estimated to generate e-waste to the tune of 1.47 lakh tonnes or 0.573 Mt per day [8] which was further revised in 2010 by CPCB and estimated it to exceed the 8 lakh tonnes or 0.8 Mt mark by 2012 [9]. In another study conducted by Electronics Industry Association of India (ELCINA) total e-waste generation was estimated to be 4.34 lakh tonnes at the end of year 2009 [10] which are further expected to grow at the rate of 10 per cent per annum [7]. Also a tremendous increase in rate of generation of e-waste is expected due to computers (500 per cent) and mobile phones (18 times) by the end of year 2020 in India and China [11]. Although, with so much variation in the estimates, it is difficult to confirm the claims related to e-waste generation yet, as India is a developing nation, the waste generation is definite to increase in future.

Typically, in India the main accused of e-waste generators are government, public and private sectors which account for approximately 70 per cent of the total waste generation. Though, the contribution of household is just 15 per cent, yet due to tendency of huge consumption of durables, even households are the potential creators of waste [12]. IMRB survey, 2009 supports this claim as it revealed that out of total e-waste generated by household, 68 per cent is accounted for by televisions followed by desktops (27 per cent). The share of imports and mobile phones was found to be 2 per cent and 1 per cent respectively [2].

A tendency of people to discard household and small business equipments only due to the reason of buying latest models has been witnessed in the recent past. In case of computers, almost 50 per cent of the computers in working condition are discarded just for the reason that these are not compatible with particular software [2]. This claim can be supported with the fact that in India 10 states alone contributed 70 per cent of the e-waste generated throughout India and 60 per cent of such waste is generated by 65 cities alone (Table1). This tendency of consumers is raising threat to human health, life and environment at an alarming rate.

Table 1. *List of States Generating E-waste.*

Sr. No.	States	E-waste Generated in Tonnes	Metropolitan Cities and others	E-waste Generated in Tonnes
1.	Maharashtra	20270.59	Mumbai	11017.1
2.	Tamil Nadu	13486.24	Delhi	9729.15
3.	Andhra Pradesh	12780.33	Bangaluru	4648.4
4.	Uttar Pradesh	10381.11	Chennai	4132.2
5.	West Bengal	10059.36	Kolkata	4025.3
6.	Delhi	9729.15	Ahmadabad	3287.5
7.	Karnataka	9118.74	Hyderabad	2833.5
8.	Gujarat	8994.33	Pune	2584.2
9.	Madhya Pradesh	7800.62	Surat	1836.5
10.	Punjab	6958.46	Nagpur	1768.9

Source: Rajya Sabha Secretariat [2]

Some studies in the past found significant contribution of imported used products in generation of e-waste in India. However, the blame of increase in e-waste generation cannot be imposed on developed nations as these products are not pushed in Indian market by the developed nations. The actual blame of mis-management of e-waste is on the policy makers as Khattar, 2007 found that out of total e-waste 95 per cent is managed by informal recyclers [13].

Identifying the growing need to manage the e-waste generated by various sectors in India, an e-waste recycling plant was installed in Roorkee in 2010. Thereafter, almost 23 such plants were installed at various locations of the country to safely manage and reduce the emission of harmful gasses in the environment while recycling e-waste. Despite of these efforts, 90 per cent of the e-waste is recycled by the players in unorganized sector [14]. Although, the government has passed Hazardous Waste (Management, Handling and Transboundry Movement) Rules, 2008 to control the management of e-waste yet the inability of the regulation to control and govern the radioactive waste generated by substances like Cobalt-60 makes this rule partially effective [15].

Studies have found presence of toxic material such as cadmium and lead in the circuit boards and computer

batteries; lead oxide and cadmium in monitor cathode ray tubes (CRTs); mercury in switches and flat screen monitors; polychlorinated biphenyls in older capacitors and transformers; and brominated flame retardants on printed circuit boards, plastic casings, cables and PVC cable insulation that releases highly toxic dioxins and furans when burned to retrieve copper from the wires [16]. Despite of the toxic nature of these substances, no secure method of recycling such components has been developed throughout the world. It has further been proved that mishandling of such substances causes serious health issues to living bodies. Few of such problems have been listed in table 2 hereunder:

Table 2. *Detail of Toxic Components and Diseases Caused.*

Sr. No.	Component	Disease
1	Lead	Kidneys, reproductive system, mental development, respiratory problems
2	Plastic	Reproductive and immune system, Water pollutant
3	Chromium	Damage liver, kidneys and cause bronchial maladies including asthmatic bronchitis and lung cancer and DNA Damages
4	Beryllium	lung diseases, Causes damages to heart liver and spleen
5	Cadmium	Causes severe pain in the joints and spine. It affects the kidneys, softens bones and neural damages
6	Acid	Sulphuric and hydrochloric acids are used to separate metals from circuit boards. Fumes contain chlorine and sulphur dioxide, which cause respiratory problems. They are corrosive to the eye and skin
7	Arsenic	Causes lungs cancer
8	Bromine	Causes the problem of inhaling
9	Cobalt	Problems to eyes and skin
10	Copper	Excessive use causes harm to immune system, stomach pain
11	Liquid crystal	Nausea irritant
12	Lithium	Damage nervous cells and system
13	Nickel	Nausea, irritant and sensation of vomiting
14	Polychlorinated Biphenyls	Causes respiratory problems
15	Selenium	Damage eyes and eyesight
16	Silver	Causes burning sensation in body
17	Zinc	Respiratory and lungs disorder.

Source: Katait [16]

This clearly indicates that the inefficient system of e-waste management can lead to serious health and environmental issues. The responsibility of handling and disposing off the e-waste cannot be left on the formal recyclers alone. The government is expected to play leading role followed by manufacturers and consumers. However, the manufacturers should try to find out suitable alternatives which can be used for producing these products. The government should pass regulations restricting the use of such toxic substances and develop infrastructure for dismantling and recycling of e-waste components. These initiatives can save life on planet earth. Apart from these some suggestions have been given hereunder:

a) One of the major hindrance in collection of e-waste is unwillingness of consumers to approach organized recyclers. Therefore, initiatives should be taken by government to establish collection centers at various locations. Moreover, attaching some financial benefit on depositing waste components with organized recyclers can reduce the rate of handling of such material by unorganized recyclers. Moreover, door to door e-waste collection can also be done to relieve end users from going to centralized collection centers. Also some monetary incentives to end consumers can also be given to motivate them to hand over their e-wastes to organized and unorganized collectors.
b) The organized e-waste recyclers can be assigned the duty to provide training to new organized recyclers as well as recyclers in the unorganized sector. This initiative will certainly reduce the chances of any mishandling of the e-waste components.
c) Government should provide subsidy to the organizations engaged in the process of e-waste management to buy latest technology equipment and vehicles for safe handling and transportation of discarded products.
d) There should be proper mechanism for disposing off the remaining material after recovery, reprocessing and restoration of electronic equipments has been done.

References

[1] Lalchandani Neha. E-scare. *The Times of India* 24th April 2010.

[2] Rajya Sabha Secretariat. E-Waste in India 2011. Accessed from *http://rajyasabha.nic.in/rsnew/publication_ electronic /E-Waste_in_india.pdf* on 15th March, 2016.

[3] Amit Jain. Global E-waste Growth in Rakesh Johri. *E-waste: Implications, regulationsand management in India and current global best practices. 2008,*4.

[4] The Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC). *Exporting Harm: The High-Tech Thrashing of Asia*. February 25th, 2002.

[5] Baldé, C. P.; Wang, F.; Kuehr, R.; Huisman, J. The global E-waste Monitor-2014. *United Nations University, IAS – SCYCLE*, Bonn, Germany.

[6] IAER Newsletter. International News on Electronic Recycling. 2009 accessed from *http://www.isrielectronics.org/communications/NL0109.html* on 4th March, 2016.

[7] Agarwal R. A Policy? Rubbish. *The Hindustan Times*, 4th May 2010.

[8] Lok Sabha Unstarred Question no.650, dt. 28.07.2010.

[9] Moushumi Basu. New E-waste Management Plan Lucrative For States. *The Pioneer*, 18th May 2010.

[10] Sandeep Joshi. Growing E-waste is Causing Concern. *The Hindu*, 28th February 2009.

[11] Young, T. E-waste a Growing Problem for China and India. 2010. Accessed from http://www.computing.co.uk on 15th March, 2016.

[12] Satish Sinha. Downside of the Digital Revolution. *Toxics Link*. 2007 accessed from http://www.toxicslink.org on 15th March, 2016.

[13] Vats, C. Mahesh and Santosh K. Singh. Status of E-waste in India-A Review. *International Journal of Innovative Research in Science, Engineering and Technology*. 2014, 3, 10, 16917-16931.

[14] Khattar, V.; Kaur, J; Chaturvedi, A. and Arora, R. E-Waste Assessment in India: Specific Focus on Delhi. 2007 assessed from http://www.weeerecycle.in/publications/reports/GTZ_MAIT_E-waste_Assessment_Report. pdf on 15th March, 2016.

[15] Comments and Suggestions made by the Ministry of Environment and Forests, Government of India on the draft backgrounder titled 'E-waste in India' prepared by the Research Unit of Rajya Sabha Secretariat. O.M. No. 23-4/2011-HSMD, dated 19 April, 2011.

[16] Katait, S. Keshaorao. Challenges and Opportunities in Electronic Waste Sector in India. *International Journal of Research in IT and Management*. 2016, 6, 2, 110-121.